Support for Monozukuri in Southeast Asia

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In Japan, the main goals of productivity improvement activities are "Fewer workers" and "Fewer man-hours." This is because the proportion of labor cost in the cost of manufacturing is relatively high, so the reduction of personnel and man-hours have a large effect on the cost. On the other hand, in Southeast Asia, the proportion of labor cost is lower at about 1/10[(1)] that of Japan. This means that the reduction of personnel and man-hours do not affect cost very much. Thus, in Southeast Asia, the more important goals are "Consistently good quality" and "Short production lead times." In this report, I will introduce some activities in Southeast Asia that are different from those in Japan.

1. Introduction

In Southeast Asia, especially in the five ASEAN countries (Vietnam, Thailand, Indonesia, Malaysia and the Philippines), the number of manufacturing sites of Japanese companies is on the increase. In order to meet rapidly growing market needs by effectively using cheap labor in Southeast Asia, these companies have established factories designed mainly for mass production. This reflects the strategy of manufacturing low-end, mass-produced products in Southeast Asia and high-end, small-quantity products in Japan.

One of the problems resulting from an increase in the number of manufacturing sites is difficulty in securing a sufficient number of local workers. In particular, there is a serious shortage of qualified management personnel, causing competition for personnel among Japanese companies. Also, in addition to low unemployment rates (stable at around 0.7% in Thailand since 2011), workers in these countries have a stronger tendency to change jobs in search of higher wages compared to Japanese workers. As a result, we sometimes hear Japanese company managers complaining about low employee retention rates as well as about the difficulty of raising the skill levels of employees.

The Japanese factory management approach often fails in Southeast Asia. Therefore, the following initiatives may be needed depending on local circumstances. How successful these initiatives are will significantly affect productivity.

(1) Explicitly define rules that are taken for granted by Japanese employees to ensure that local workers can understand them.
(2) Standardize work procedures (compile manuals) as much as possible so that any worker can replace another worker who quits the job.
(3) Visualize operational status to create an environment that enables managers to make appropriate decisions immediately.

Adopting the concept of "shared services for production support" as one of their policies, IHI Asia Pacific (Thailand) (IHIAPT) and IHI Asia Pacific (IHIAP) provide IHI group companies with a variety of support services, including the above initiatives, to help increase productivity under the leadership of IHIAPT in Thailand and of IHIAP in Southeast Asia as a whole.

2. Support for the launch of factories in Southeast Asia

In July 2013, IHI Machinery and Furnace Co., Ltd. (IMS) launched a manufacturing site (IHI Machine Tech Asia: IMTA) in Thailand for the production of a new type of vacuum washing machine. IMTA is currently producing several units per month. IHIAPT and IHIAP provided the following support for the launch of IMTA.

(1) Standardized work instruction sheets
Standardized work instruction sheets are designed to provide detailed instructions for all operations, ranging from the setting of "O" rings through to the tightening of bolts, and to serve as a dictionary to consult whenever necessary, thereby eliminating the need to depend on people for know-how.

(2) Drawings for description
Checking drawings during operations interrupts the operations and causes production lead time to increase. Also, checking drawings is not the same as being able to understand them. While providing training to enable workers to understand drawings, we need to help them concentrate on assembly without having to check drawings during operations in order to reduce production lead time. In an effort to help workers avoid checking drawings during operations, we provide drawings for description as references for workers. These drawings show only the sizes required for assembly by using photographs and sketches to help workers understand

the operations.

(3) Digital mockups

Digital mockups enable workers to check the workflow (connections between different operations) by using 3D-CAD animated video.

(4) Parts list

A list of parts that include the names, drawing numbers, and numbers of units of all parts used in each assembly process to reduce the time and effort to search for parts.

(5) Parts album

An album of photographs of all parts, each taken with its drawing number, to enable even a newly employed worker to gather related parts easily.

Meanwhile, as mentioned in **Chapter 1**, **Section (3)**, in order to minimize problems that may occur in Southeast Asia more frequently than in Japan, it is necessary to quickly gather information on factory operations (progress in operations, number of man-hours required, procurement performance, etc.) and to take the next action. Some companies in Japan use commercially available IT (Information Technology) software to visualize factory operations. However, for companies that are working to branch out into Southeast Asia for the first time, introducing such software imposes large fixed costs even before starting production. To avoid this, as part of their shared services for production support, IHIAPT and IHIAP identified functions that are required for management by IMTA and developed a production and procurement information management system that provides all these functions. This system is designed to be as general a system as possible so it can be used by other companies as well. It performs a variety of functions, including automatic daily production scheduling by machine number, aggregation of production lead time data by manufacturing process, and aggregation of man-hour data, for production management. In this article, with a view to promoting collaboration between manufacturing sites in Japan and Southeast Asia, we introduce the following two functions: drawing management and visualization of the procurement cost.

3. Greater importance of drawing management in factories in Southeast Asia than in Japan

First, we would like to introduce a drawing management system jointly developed between Japan (IMS) and Thailand (IMTA).

Even in Japan, where the design, procurement and production departments are physically close, with no difference in language or time, problems sometimes occur in drawing management. For example, the following rules do not themselves constitute a system for effectively reporting drawing updates.

(1) The design department copies newly created or updated drawings into a specified folder.

(2) The procurement and production departments check the specified folder periodically.

Adding a rule that the design department must send an e-mail to related parties to notify them that the drawings have been copied does not prevent problems from occurring for the following reasons: ① the design department staff in charge may forget to send the e-mail, and ② the procurement/production department staff may forget to check the folder even when they have received the e-mail. As a result, the procurement department may place orders based on old drawings or the production department may make errors in product assembly.

If the design, procurement and production departments are physically far apart, with differences in language and time, and production is conducted based on the division of functions (with products being designed in Japan and produced in factories overseas), the risk of such problems becomes even greater. Mass production is designed based on a small-profits-and-quick-returns business model that uses the same drawings repeatedly. To generate profits under this business model, it is more important to manage drawings properly than in Japan (errors in drawings have stronger impact on profits than in Japan).

The causes of the above problem are that information is processed by forgetful humans and that the destinations of information on drawing updates are limited. To eliminate these causes, we developed a system that follows the following steps between IMS's Iwakuni factory (design department) and IMTA (procurement/production department). The system was developed for operation based on two key terms: (1) full automation and (2) checking of drawing updates by all members (**Figs. 1** and **2**).

Step 1

The system automatically copies all drawing files (approximately 1 550 files), both new and old, periodically from the IMS Iwakuni factory's drawings database server into IMTA's drawings database server. Currently, the system copies files late at night every Sunday. The interval at which the system copies files can be set freely.

Step 2

Japanese characters may be garbled on local PCs. To avoid this, the system removes Japanese characters from the names of copied files.

Step 3

The system compares the names, dates and times of updates between all newly copied files and previously copied files in order to search for ① files with names appearing for the first time, and ② files with the same names but new dates and times of updates.

Step 4

The system registers the names of existing relevant files on the list of updated drawings in the database.

Step 5

The system regards new drawing files or files with the same names as previous files but with the most recent dates or times of updates as the latest drawing files that are currently in use and automatically sorts the latest drawings into separate folders from the others.

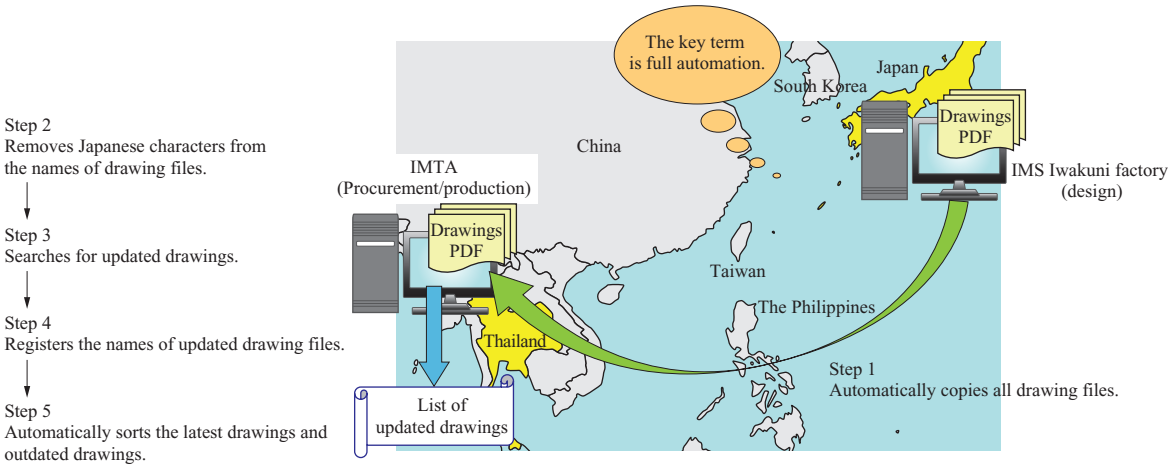


Fig. 1 Framework of new drawing control system 1

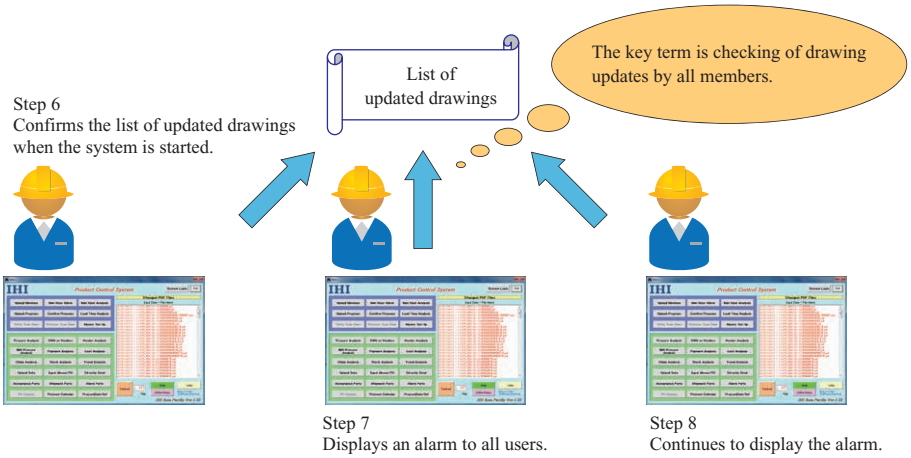


Fig. 2 Framework of new drawing control system 2

Step 6

The system checks the list of updated drawings that was registered in Step 4, after user authentication when the system was started (to check whether there are new or updated drawings).

Step 7

If relevant updated drawing files are found, the system displays the same alarm on the opening screens of not only a limited number of staff members in charge, but on the opening screens of all system users.

Step 8

The system continues to display the alarm on the following days unless staff in charge have taken the necessary action to disable the alarm. More specifically, the system follows the rule that the alarm can only be disabled after confirming that the procurement department has placed orders using new drawings and that the production department has replaced outdated drawings used in the factory with updated drawings.

Steps 1 through 5 were designed to realize the concept of (1) "full automation" and steps 6 through 8 the concept of (2) "checking of drawing updates by all members." **Figure 3** shows an opening screen that displays an alarm.

This new system eliminated careless oversight of changes in the exchange of drawing files, ranging from minor changes to a few files to changes to hundreds of files at once at a version update.

4. Visualization of the procurement cost by machine number

Generally, procurement costs account for 80% to 90% of the total manufacturing cost of products mass-produced in Southeast Asia, although the percentage varies depending on products. In this section, we introduce a case study of a program for visualizing the procurement cost.

When aggregating procurement costs by machine number, it is possible to calculate momentary values for each transaction, even if such calculation may involve a large amount of time and energy. However, procurement cost data is updated every day. Therefore, aggregation results that have been obtained at the expense of time and energy soon become outdated and unusable as indicators. However, aggregating data frequently requires too much work and involves other difficulties. Furthermore, if a procurement division has multiple operating sites in Japan and overseas, complex, additional operations such as those listed below may also be necessary.

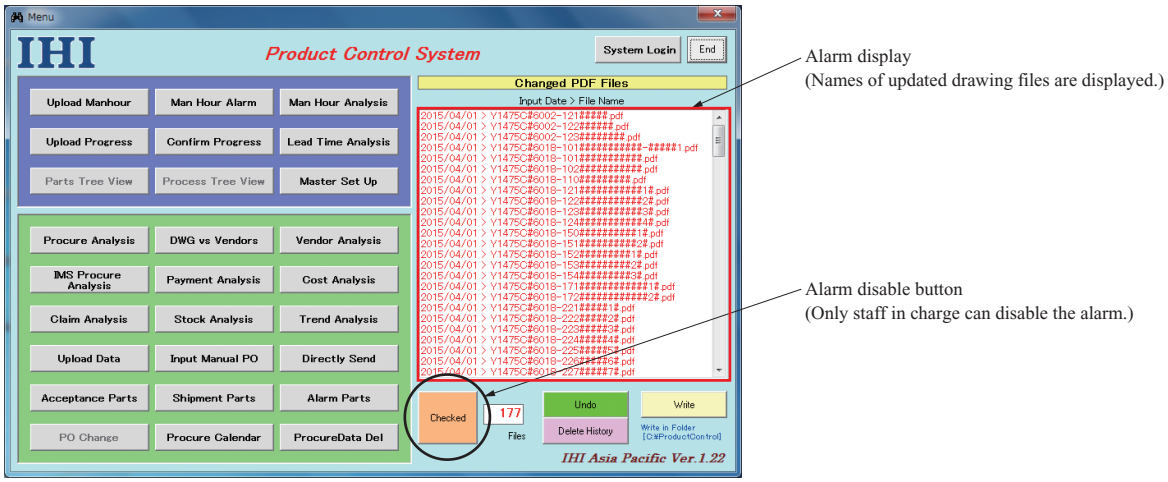


Fig. 3 Opening screen with alarm

(1) Operations required to unify the formats for order placement data before aggregating procurement costs at operating sites in Japan and overseas (generally, different systems are used at different sites for the management of procurement costs)

(2) Operations for sorting collective (bulk) orders by machine number (generally, different sites have different rules regarding the number of units for collective orders)

(3) Operations for integrating different currencies for data aggregation

In relation to (3), in particular, the following kind of problems may occur.

① Once aggregating procurement costs at operating sites in Japan and overseas resulted in a total of 10 million yen. This figure (10 million yen) becomes widely known in all departments in the company and begins to take on a life of its own.

② Since currency exchange rates change in one year, it will be necessary to recalculate procurement costs at overseas sites one year later. However, individual departments don't have access to information about the percentage of procurement costs at overseas sites in the total of 10 million yen. Therefore, they continue to use the same total procurement cost (10 million yen) without knowing the difference between this total and the actual total cost. In addition, as more and more materials are locally procured, items procured in Japan and overseas change over time, making the difference even larger.

As mentioned earlier, production in Southeast Asia is designed based on a small-profits-and-quick-returns business model. Therefore, to generate stable profits, it is important to gather accurate data on procurement costs (i.e., profits that can be secured) by machine number before setting prices. However, under circumstances where past figures take on lives on their own as in the above example, it becomes difficult to know even whether there is any profit until accounts are settled at the end of the fiscal year.

To summarize, there are two major problems in aggregating procurement costs by machine number.

① Despite the large amount of time and energy involved, the aggregated results lose their reliability in a short period of time.

② Calculating only the combined total of procurement costs in Japan and overseas is not sufficient for obtaining the latest costs that reflect changes in exchange rates.

Regarding the first problem, it is impossible to avoid a decrease in the reliability of aggregated values over time. Therefore, we decided to significantly reduce the amount of time and energy spent for aggregation operation and to frequently repeat the same operation to always obtain the latest value. To resolve the second problem, we decided to save data on procurement covered by overseas sites in local currencies separately from procurement costs in Japan and to recalculate costs on the spot by using exchange rates specified by users when aggregating costs.

Our system follows the following steps in aggregating procurement costs by machine number.

Step 1

By using this system, IMTA and IMS staff in charge of procurement periodically (once every other day at IMTA and once every week at IMS) register ① new order placement data, and ② revised order placement data from procurement systems used in these companies in a database on the IMTA server. As a result, all order placement data about new types of vacuum washing machines in Thailand (IMTA) and Japan (IMS) is accumulated in the database on the IMTA server. This system uses different programs to read order placement data for IMTA and for IMS. However, order placement data from the two companies is automatically registered in a unified format. The system is also designed to automatically sort collective order placement data by machine number.

Step 2

Users have only to designate machine numbers for confirmation on this system to separately display aggregated procurement costs for IMTA and IMS.

IMTA data is shown on the system in different colors

for different categories of orders to distinguish between orders for products that have already been inspected (white), orders fulfilled (yellow) and orders for products to be delivered in multiple installments or products not yet delivered (orange).

Step 3

If an exchange rate is entered manually, the system displays the total aggregated value in Japanese yen (JPY) and in Thai baht (THB). To allow users to simulate, for example, how much past procurement costs for a machine number would be at the current exchange rate, exchange rates can be entered manually.

Figure 4 shows a screen that visualizes procurement costs by machine number. The upper half of the screen shows a list of procurement costs and aggregated values in IMTA (Thailand), while the lower half shows a list of procurement costs and aggregated values in IMS (Japan). Boxes at the bottom of the screen show the sum of aggregated values in JPY and THB calculated at the manually entered exchange rate.

The above system was put in operation in February 2015 at an IMTA and two IMS sites.

5. Conclusion

In conclusion, we would like to explain about the image of shared services for production support that IHIAPT aims to deliver.

IHIAPT was founded about a year ago as the IHI group's managing company in Thailand. In consideration of the function of shared services for production support, merely providing support in every IHI group company does not allow the IHI group to fully benefit from its advantages. For the small and medium-sized individual business sections of IHI group companies to effectively compete with powerful competitors branching out into Thailand and Southeast Asia, it is necessary to connect IHI group companies so as to increase their comprehensive capabilities. To this end, we are currently working to develop a framework centered around this system, as shown in **Fig. 5**, in order to establish the connection.

Effects expected from the new framework include the following: ① using procurement information to reduce costs by placing collective orders by volume for IHI group companies and by placing orders to different suppliers, and

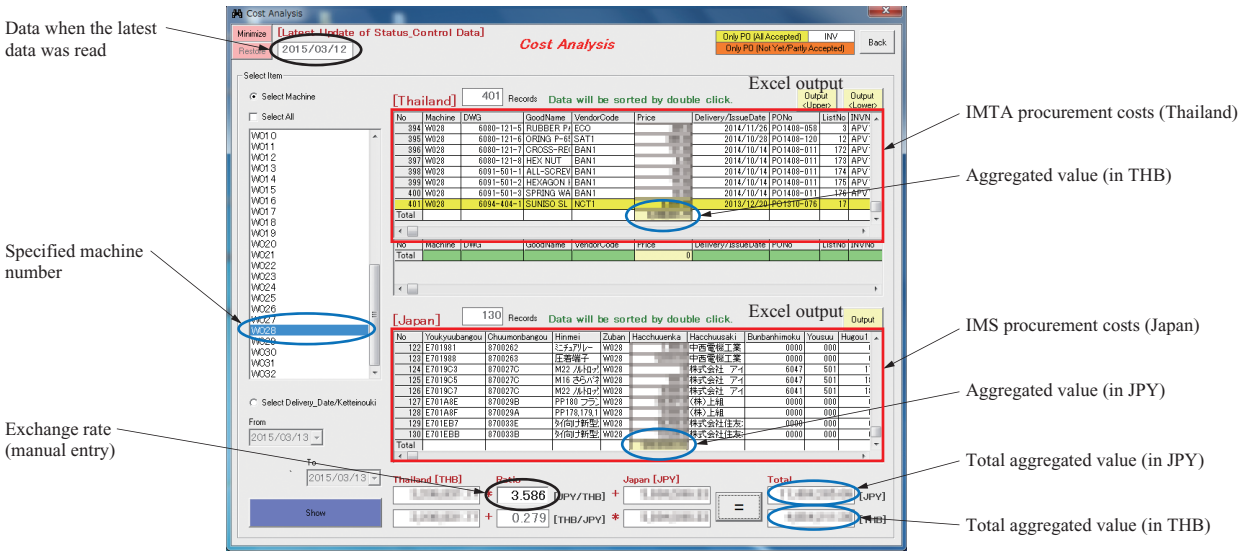
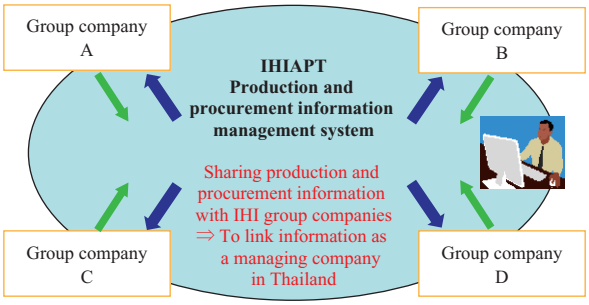


Fig. 4 Visualized data of the procurement cost of each machine



(Note) : [Production and procurement information]
Centrally managing the production and procurement information on individual IHI group companies by IHIAPT
: [Production and procurement support]
Connecting the centrally managed production and procurement information to perform various analyses and to make proposals

Fig. 5 Conceptual image of "Shared service for manufacturing support" that IHIAPT is aiming for

② using production information to provide and receive materials and equipment in accordance with IHI group companies' progress in production, to request vendors to reschedule (delivery date) forward or back, and to share information on troubleshooting and safety.

IHIAPT and IHIAP will acquire know-how through efforts to provide support for IHI group companies' production sites in Thailand and Southeast Asia and will continue to support business expansion by providing proposals and collaboration across different group companies.

REFERENCES

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